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ABSTRACT

A study was conducted to investigate the predictive validity of parents' ability to attend to their children (ATA) on intelligence and to determine to what extent ATA and social class variables, in combination, can account for the discrepancy in the IQ scores of children of different races. Ss were 700 Head Start children. The criterion variables used were the results of two administrations (at the beginning and end of the school year) of the Wechsler Preschool and Primary Scale of Intelligence. The predictor variables were number of siblings, father presence or absence, ATA rating of neighborhood, status according to the Head Start poverty guidelines, and race. The data supported both hypotheses: (1) that variables describing parents ability to attend to their children, combined with a general social class variable, can be used to predict intellectual achievement; and (2) that, having developed a regression equation using ATA and social class variable, the addition of ethnic variables will not significantly add to the predictive value. (KM)

PARENTS' ABILITY TO ATTEND TO CHILDREN: PREDICTORS OF INTELLIGENCE

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INTRODUCTION

The classic "nurture-nature" conflict concerning intellectual characteristics needs little documentation. However, the recent changes in social, economic, and educational institutions in this country have lead to further speculation concerning the improvement of education for what are called euphemistically "disadvantaged children." The money that federal and state governments are spending on the various programs has, among other things, permitted much data to be collected on children whom we traditionally think of as intellectually less capable.

Black children and Mexican-American children do not score as high on standardized IQ tests as white-anglo children. Because of the misinterpretation of the concept of "equality" many investigators have looked for and found alternate variables to explain this discrepancy. Measures of social class are in the forefront of such investigations. The authors of the present study have postulated an alternative way of thinking about social class variables, i.e., measuring the ability of parents to attend to their children (ATA).

The purpose of this study was to investigate the predictive validity of ATA variables and to determine to what extent ATA and social class variables, in combination, can account for the discrepancy in the IQs of children of different races.

METHOD

The Criterion Variables

Two criterion variables were used for this study, the results of two administrations of the Wechsler Preschool and Primary Scale of Intelligence (WPPSI). The four sub-tests were:

1. Vocabulary
2. Similarity
3. Picture Completion
4. Block Design

These tests were administered at the beginning and ending of the academic year, approximately nine months apart.

The Predictor Variables

For this study seven predictors were considered: three Ability to Attend variables, a general social class variable, and three race variables.

1. Number of Siblings (ATA)

It was postulated that the more children in the family, the less time the adults in residence would have to spend with the younger children. This should therefore lead to a negative correlation with

any achievement variables. A more thorough logical analysis postulated a curvalinear relationship. The logic behind this is that if there are older siblings, they could become parent surrogates and have a positive influence on the younger children. This might be particularly true among the Mexican-American families, since their sub-culture emphasizes the value of older children caring for younger ones. However, this curvalinear relationship was not tested in the present study.

2. Father in the Home

If one parent is absent from the home it is most often the father. It is apparent that a one part family would provide a more limited ability to attend than a two part family. This variable was coded 0 = Father Absent, 1 = Father Present.

3. ATA Rating

This is a composite rating by the Far West Laboratories staff of the general milieu of the neighborhood which the school is serving. In general, it includes the physical conditions surrounding the dwellings, the population density, the outside presence of danger to children, etc. This variable is akin to what others have called "crowding ratio."

4. Child within Headstart Poverty Guidelines

This is a legal descriptor of income and family status. For this study it was coded as a dichotomous variable, with 0 = the child coming from a family which was within the poverty guidelines,

and 1 = those children who were slightly above that minimum.

All but a very small proportion, less than two per cent of the subjects, were black, white, or Mexican American. Three dichotomous dummy variables were created from the ethnic background information. These were

black-not black

white-not white

Mexican American-not Mexican American.

Sample

A total of 700 headstart children were used for this study. These children came from 15 districts from all sections of the country. A description of these subjects in terms of their sex and each of the seven variables listed above appears in Table I. They were randomly divided into three sub-samples: a working sample of 228, a cross-validation sample of 265, and a second or holdout sample of 207. These three samples were comparable on all descriptive variables.

The four sub-tests of the WPPSI were administered to each of the 700 subjects twice, once early in the school year (pre-test) and once close to the summer break (post-test).

Hypothesis

There were two major hypotheses for this study. 1: that variables describing Parents' Ability to Attend to their children combined with

a general social class variable can be used to predict intellectual achievement. 2: that having developed a regression equation using ATA and social class variables, the addition of ethnic variables will not significantly add to the predictive value.

Data Analysis

Using only the working sample (N = 228), regression equations were developed. In the initial stages of the analysis, many predictors were used to develop equations for each of the sub-tests as well as the total score for both the pre and post tests. Among the potential predictors which were eliminated were two Ability to Attend variables: "Mother Works" and "Mother in the Home."

Though significant multiple correlations were obtained for each of the sub-test scores, they were in general rather low, i.e., .25 for pre-test picture completion to .47 for post-test block design. It was therefore decided to restrict further work to two criterion variables, the pre- and post-test totals.

The development of the multiple R and the regression equations on the working sample was not in itself a test of the first hypothesis. Without a cross validation on a similar sample, no conclusions could be drawn concerning the validity of ATA and social class variables to predict intelligence. Many cross validation studies are carried out by simply submitting the holdout sample data to the multiple regression programs, forcing the same predictors as in the working sample. The validity of prediction is assumed to be related to how close the beta

weights and multiple correlations are to those of the working sample. This was not done in the present instance. It was determined that a better alternative would be to apply the regression equation developed on the working sample to the data from both working and holdout samples. To the extent that the variance of the residuals (the difference between the predicted and obtained score) was less than the variance of the scores themselves, the equation could be considered valid for prediction.

To test the second hypothesis, that race variables will not improve the prediction, another data analysis procedure was instituted. This consisted of computing a multiple correlation with a criterion of total Wechsler with three ATA variables: Number of Siblings, Father Living at Home, and ATA ranking, then adding Child within Headstart Poverty Guidelines. Each of the race variables, black/not black, white/not white, Mexican American/not Mexican American was tried with the five variable equation and finally all three were tried simultaneously.

RESULTS

Table II contains the regression equations which were developed on a working sample. Both the b weights and beta weights are included. Note that each predictor picks up significant weight.

Table III reports the mean and standard deviation for the Wechsler total pre- and post-tests for each of the three samples, as well as the standard deviation of the residuals for each sample. Note

that the reduction in variance is greatest for the working sample. This is to be expected since the equation used represents the best fit hyper-plane for the sample. However, for both the remaining cross validation samples the reduction in variance appears significant.

The results of testing race variables in addition to the ATA and social class variables appear in Table IV. Note that for both pre- and post-Wechsler totals the multiple correlation is not changed significantly by the addition of race. In the case of the pre-test, there is no change in R and a slight increase in the standard error of estimate. In the case of the post-test, R changes at most .02, using all three race variables simultaneously.

The inter-correlations of the seven predictors used and their zero order correlation with WPPSI totals appear in Table V. This table is included anticipating curiosity on the part of the reader concerning the relationship of race and ATA variables.

CONCLUSIONS

The first hypothesis dealing with the relationship between ATA variables and IQ is certainly supported by the data reported above. The zero order correlations between these variables and the Wechsler totals range from .19 to .47. In combination, the multiple correlation of .51 and .56 indicates that the four variables account for 26% and 31% of the variance on IQ. These data appear in Table II and Table IV.

More impressive evidence of the predictive validity of ATA variables is presented in the cross validation study. (Other investigations of this nature seem to contain methodological problems on two points. First, they tend to lump 6, 10, or even 14 highly inter-correlated variables together in a regression equation. At a very high probability, this number of predictors cannot pick up meaningful beta weights in a regression equation. The second methodological error is by omission rather than commission, i.e., no cross validation of the equations which were developed. The concept of "holdout sample" seems to have disappeared.)

The results of the cross validation of the present study appear in Table III. The reader is asked to compare the discrepancy in the standard deviation of the test scores with the standard deviation of the residuals. The working sample is that group of 228 subjects from which the regression equations were developed. The residuals are the differences between the obtained score and the score predicted from the equation. For the working sample this discrepancy (8.60 to 7.39 on the pre test and 8.79 to 7.27 on the post test) is considerable. However, this significant reduction in variance is not the evidence required to demonstrate that ATA variables can predict IQ scores. The very development of the equations led to this best fit hyper-plane for this sample of subjects. It is only the application of this equation to two other comparable samples

from the same population of children that give the evidence that is sought. For sample 2 the reduction in standard deviation from test scores to residuals (9.80 to 8.93 for the pre test and 9.70 to 8.14 for the post test) indicates that this regression equation can indeed be used to make better than chance predictions. Similar results were obtained using an alternate holdout sample of 207 children.

The second question which this study examined concerned how much additional variance in IQ above and beyond that which was explained by ATA could be accounted for by race. The dramatic answer to that question is: almost none. Table IV gives the data from which this answer evolves. On the pre test the multiple correlation of .51 was not influenced by any of the three race variables or all three in combination. On the post test the influence was minimal, i.e., one per cent for two of the three race variables individually and two per cent for all three in combination.

The data presented in this study are significant. The concept of statistical significance is of course an irrelevance since for correlation coefficients statistical significance is related to N. Considering the size of the samples used, any correlation coefficient over .10 can be used to reject the hypothesis that rho equals zero. Rather, the significance referred to is that the variables which explain a portion of the variance of measured IQ are those which are amenable to change by social action. The authors of this study are not implying causal relationships on the basis of the evidence

presented here. They are rather asserting that it is more comfortable and more reasonable in our society to account for variance on IQ tests with constructs that can be modified by appropriate societal decisions.

TABLE I

Descriptive Data on Working, Cross Validation, and Holdout Samples

	1. Working Sample Only N = 228	2. Cross Validation N = 265	3. Holdout Sample N = 207
Age (post)	$\bar{X}$=72.7 S=3.7	$\bar{X}$=72.6 S=4.4	$\bar{X}$=72.0 S=8.6
# Siblings	$\bar{X}$= 2.7 S=1.2	$\bar{X}$= 2.6 S=1.3	$\bar{X}$= 2.3 S=1.3
Wechsler Total			
pre	$\bar{X}$=39.0 S=8.6	$\bar{X}$=38.8 S=9.8	$\bar{X}$=40.5 S=9.7
post	$\bar{X}$=43.1 S=8.9	$\bar{X}$=43.2 S=9.6	$\bar{X}$=43.1 S=9.2
Sex	F 53.5% M 46.5%	F 50.5% M 49.5%	F 51.7% M 48.3%
Race	B 53.1% W 32.5% M/A 13.2%	B 50.2% W 31.3% M/A 14.1%	B 42% W 40% M/A 16%
Within Poverty Guidlines	Yes 78.1% No 21.9%	Yes 80% No 20%	Yes 82.1% No 17.9%
Father Living at Home	Yes 61.4% No 38.6%	Yes 64% No 36%	Yes 64.7% No 35.3%

TABLE 11

Regression Equations for Pre and Post Wechsler Totals

PRE TEST

	Multiple R	R^2	Simple r	B	Beta
ATA Rating	.29	.08	-.29	-.38	-.19
Within Poverty Guidelines	.40	.16	.35	6.02	.25
# Siblings	.41	.17	-.19	-.75	-.10
Father at Home	.42	.18	.11	1.17	.06
			Constant 55.50		

POST TEST

ATA Rating	.41	.17	-.41	-.58	-.29
Within Poverty Guidelines	.52	.27	.43	7.10	.30
# Siblings	.54	.29	-.24	-.96	-.13
Father at Home	.54	.29	.11	.77	.04
			Constant 55.42		

Means and Standard Deviations of Pre and Post Test Wechsler Totals and the Standard Deviation of the Residuals for the Three Samples

	Pre		Residual	Post		Residual
Sample I N = 228	$\bar{X}$ 39.0	S 8.60	S 7.39	$\bar{X}$ 43.1	S 8.79	S 7.27
Sample II N = 265	38.8	9.80	8.93	40.5	9.70	8.14
Sample III N = 207	40.5	9.67	9.27	43.1	9.17	8.23

TABLE IV

Multiple Correlation of Wechsler Pre and Post Totals With ATA Variables and the Addition of Race Variables

(Working Sample N = 228)

PRE	R	R^2	Change in R^2	Standard Error of Estimate
# Siblings Father at Home ATA Rating Within Poverty Guidelines	.51	.26	.03	7.49
All of the above + Black	.51	.26	.00	7.51
All of the above + White	.51	.26	.03	7.51
All of the above + Mexican American	.51	.26	.00	7.51
All of the above + all Races	.51	.26	.00	7.52
POST				
# Siblings Father at Home ATA Rating Within Poverty Guidelines	.56	.31	.02	7.37
All of the above + Black	.56	.31	.00	7.39
All of the above + White	.57	.32	.01	7.34
All of the above + Mexican American	.57	.32	.01	7.33
All of the above + all Races	.58	.33	.02	7.31

TABLE V

Inter-Correlations of ATA, Race, and Wechsler Pre and Post Test Totals

(Sample N = 226)

	Within Poverty Guidelines	# of Siblings	Father at Home	ATA Ratings	Black	White	Mexican American	Pre-Test	Post-Test
Within Poverty Guidelines									
# of Siblings	-.37								
Father at Home	-.31	-.01							
ATA Rating	-.41	.26	-.10						
Black	-.31	.12	-.15	.64					
White	.42	-.19	.11	-.61	-.74				
Mexican American	-.14	.11	.07	-.08	-.41	-.27			
Pre-Test	.41	-.30	.19	-.36	-.25	.27	.00		
Post-Test	.47	-.29	.21	-.41	-.28	.37	.12	.71	--